

CLAIMS

1. A method of manufacturing piping having a joining portion in which a diameter expanding portion is formed at an end portion of a pipe, comprising the steps of: fixing the pipe by clamping an appropriate portion of the pipe with a pipe chuck for adjusting the pipe length simultaneously when the expanding diameter portion is formed; engaging a connector having a through-hole, the inner diameter of which is expanded, with an end portion of the pipe; and caulking an end portion of the pipe with a diameter expanding tool so as to expand the diameter of the pipe end portion and caulk it to an inner face of the connector, wherein, as a pipe fluctuation absorbing portion, which is a relief space of the pipe material, is previously formed in a portion on the inner face of the connector, when a plastic deformation is given to the pipe end portion by the diameter expanding tool so as to form a diameter expanding portion, an excess pipe material is absorbed by the pipe fluctuation absorbing portion and the pipe length is reduced and automatically adjusted to a predetermined length.

2. A method of manufacturing piping having a joining portion according to claim 1, further comprising the step of: reducing the length of the pipe by forming an annular protruding portion on an outer circumference of the pipe when a portion of the pipe material is pushed out into the relief space previously formed on the end face of the pipe chuck by buckling the pipe when one of the pipe end portions is given a stroke by a punch used for sizing, after the step of fixing the pipe by clamping an appropriate portion of the pipe by the pipe chuck.

3. A method of manufacturing piping having a joining portion according to claim 2, wherein a quantity of reduction of the pipe length is increased when a radius of the protruding portion is increased.

4. A method of manufacturing piping having a joining portion according to claim 3, wherein a height of

the relief space formed on the basis of the end face of the pipe chuck is maintained constant.

5        5.    A method of manufacturing piping having a joining portion according to claim 1, wherein after an end portion of the pipe on the side opposite to the side on which the diameter expanding portion is formed has been fixed at a predetermined position by a jig, when an appropriate portion of the pipe is clamped and fixed by the pipe chuck, the length of the pipe is adjusted on the basis of an end face of the pipe chuck.

10       6.    A method of manufacturing piping having a joining portion according to claim 1, wherein the pipe fluctuation absorbing portion formed inside the connector is formed in a gap between the inner face of the through-hole of the connector and the surface of the diameter expanding tool.

15       7.    A method of manufacturing piping having a joining portion according to claim 6, wherein the pipe fluctuation absorbing portion is formed corresponding to an end portion of the pipe located inside the connector.

20       8.    A method of manufacturing piping having a joining portion according to claim 6, wherein the pipe fluctuation absorbing portion is formed corresponding to an intermediate portion of the pipe located inside the connector.

25       9.    A method of manufacturing piping having a joining portion according to claim 1, wherein the pipe is caulked to the connector when a diameter expanding portion is formed in one end portion of the pipe so that the pipe is caulked to the connector, and the simple connector is caulked to the other end portion of the pipe.

30       10.   A method of manufacturing piping having a joining portion according to claim 1, wherein when a sleeve provided on an outer circumferential portion of the diameter expanding tool is moved differently from the diameter expanding tool, the connector is held before and

after the diameter expanding portion is machined.

11. A method of manufacturing piping having a joining portion according to claim 10, wherein an expanded forward end portion of the pipe is crushed by a portion of the end face of the sleeve, and the crushed material is made to flow into the pipe fluctuation absorbing portion.

12. A method of manufacturing piping having a joining portion according to claim 1, wherein a plurality of pipes are connected with a common connector at least one of the end portions of the plurality of pipes.

13. A method of manufacturing piping having a joining portion according to claim 1, wherein instead of the connector connected with the diameter expanding portion of the end portion of the pipe, a female type jig capable of being split having a through-hole, the inner face of which is expanded, is used so that the end portion of the pipe is expanded and caulked to the inner face of the female type jig, and then the female type jig is opened.

14. A method of manufacturing piping having a joining portion, the piping having a connector at an end portion, comprising the steps of: clamping and fixing an appropriate portion of the pipe for adjusting length of the pipe simultaneously when the connector is attached to the end portion; engaging the connector having a through-hole with the end portion of the pipe; and forming and caulking the end portion of the pipe to the connector so that the length from the clamping position to the end portion of the pipe can be constant, wherein the length of the pipe is reduced when an excess material of the pipe is absorbed by the caulking portion so as to adjust the length of the pipe to a predetermined value.